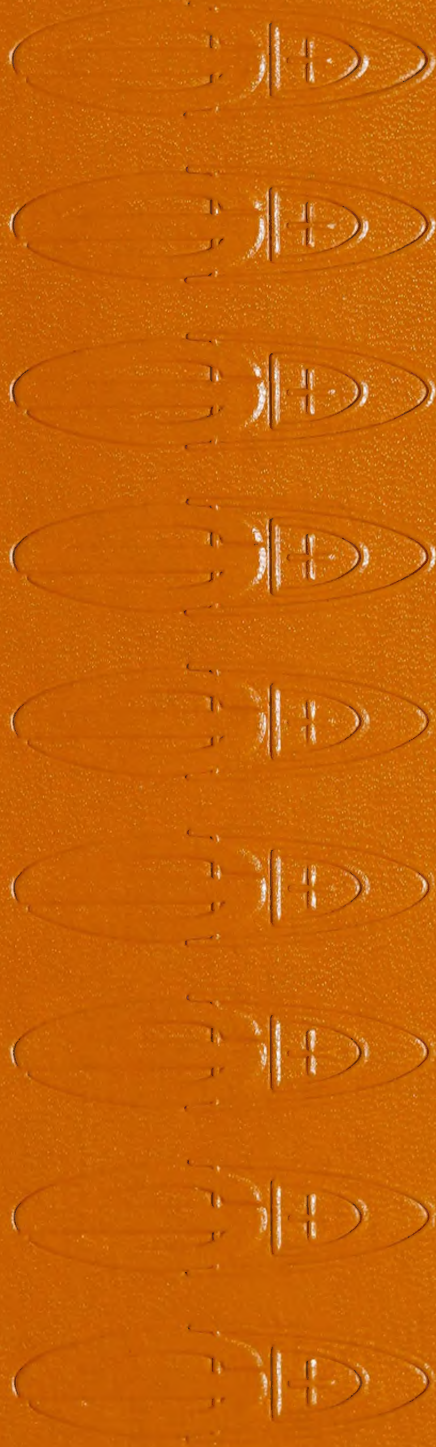




CONCORD INSTRUMENT
DIVISION
MODELS 8181-6 & 8181-
REMOTE TIME DISPLAY



Concord Instrument Division

06811

INSTRUCTION MANUAL

RECEIVING INSPECTION

REPAIRS

CONCORD INSTRUMENT
DIVISION
MODELS 8181-6 & 8181-9
REMOTE TIME DISPLAY

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WARRANTY

Systron-Donner instruments are warranted during a period of one year from date of shipment to original purchaser to be free from defects in material and workmanship. This warranty does not apply to vacuum tubes, except as these are warranted by tube manufacturers. The liability of Seller under this warranty is limited to replacing or repairing any instrument or component thereof which is returned by Buyer, at his expense, during such period and which has not been subjected to misuse, neglect, improper installation, repair, alteration, or accident. Seller shall have the right to final determination as to the existence and cause of a defect. In no event shall Seller be liable for collateral or consequential damages. This warranty is in lieu of any other warranty, expressed, implied, or statutory; and no agreement extending or modifying it will be binding upon Seller unless in writing and signed by a duly authorized officer.

RECEIVING INSPECTION

Every Systron-Donner instrument is carefully inspected and is in perfect working order at the time of shipment. Each instrument should be checked as soon as received. If the unit is damaged in any way, or fails to operate, a claim should immediately be filed with the transportation company.

REPAIRS

Whenever a Systron-Donner instrument requires service, the nearest Systron-Donner representative should be contacted; all representatives will provide immediate service or arrange factory returns when necessary.

Please specify both model and serial number in all correspondence concerning Systron-Donner instruments. Address all inquiries on operation or applications to your nearest sales representative; or, Sales Manager, Concord Instrument Division, Systron-Donner Corporation, 10 Systron Drive, Concord, California 94518.

TABLE OF CONTENTS

		Page
CHAPTER 1 - GENERAL DESCRIPTION		
1.1	Basic Functions	1-1
1.2	Application	1-1
1.3	Standard Features	1-2
1.4	Specifications	1-3
1.5	Models Available	1-4
1.6	Options	1-5
1.7	Package	1-5
CHAPTER 2 - INSTALLATION		
2.1	Initial Inspection	2-1
2.2	Storage and Reshipment	2-1
2.3	Power Requirements	2-2
2.4	Yoke Mounting	2-3
2.5	Installation	2-3
CHAPTER 3 - OPERATION		
3.1	General	3-1
3.2	Operating Conditions	3-1
CHAPTER 4 - MAINTENANCE AND CALIBRATION		
4.1	Factory Service	4-1
4.2	Routine Maintenance	4-1
4.3	Printed-Circuit Board Repair	4-2
4.4	Logic Functions	4-3
4.5	Operational Test & Calibration	
	Procedure	4-6
4.5.1	Recommended Test Equipment	4-7
4.5.2	Power Supply Regulator Dwg. #21757-7-2.	4-7
CHAPTER 5 - OVERALL FUNCTIONAL DESCRIPTION		
5.1	General	5-1
5.2	Functional	5-1
CHAPTER 6 - CIRCUIT DESCRIPTIONS		
B21480-7-1	Single Digit Nixie Readout (Large Tube)	
	Schematic	6-2
	Chassis Assembly Parts List 8181-6 . .	6-3
B21479-7-1	Single Digit Nixie Readout (Super Tube)	
	Schematic	6-4
	Chassis Assembly Parts List 8181-9 . .	6-5

TABLE OF CONTENTS (Cont'd)

CHAPTER 6 - CIRCUIT DESCRIPTIONS (Cont'd)		Page
C21543-7-2	Time-of-Day Accumulator Circuit	
	Description	1
	Assembly	2
	Schematic	3
	Parts List	4
A21547-7-9	3-Digit Accumulator W/Buffers Circuit	
	Description	1
	Assembly	3
	Schematic	4
	Parts List	5
C21574-7-1	AGC & Cycle Detector Circuit	
	Description	1
	Assembly	2
	Schematic	3
	Parts List	4
D21588-7-1	IRIG Reader Logic Circuit Description .	1
	Assembly	3
	Schematic	4
	Parts List	5
C21757-7-2	Power Supply Circuit Description . . .	1
	Assembly	2
	Schematic	3
	Parts List	4

IMPORTANT MAINTENANCE INFORMATION
FOR
PRINTED-CIRCUIT BOARD REPAIR

NOTE

READ BEFORE CHANGING ANY COMPONENT
ON A PRINTED-CIRCUIT BOARD

When replacing integrated circuits or other electronic components soldered to printed-circuit boards, the procedures indicated below must be followed or damage to the board may result:

1. Determine by troubleshooting techniques, which integrated circuit or discrete component(s) has failed.
2. Remove the defective component(s) from the board by cutting the pins or leads with a small diagonal clipping tool. (Always remove and replace the entire component.)
3. Apply heat (40-50W soldering iron) sparingly to each of the cut pins or leads and remove from the board; clean the hole(s) with a toothpick or solder suction tool.
4. Form the tinned leads of the replacement part and insert in the printed circuit holes; solder, then trim leads to extend 1/16-inch beyond the back surface of the board. (Use only 63-37 solder with maximum 1/16-inch diameter.)

CAUTION

Always trim semiconductor leads only after soldered installation is complete. This procedure greatly lessens the possibility of component failure due to shock-wave damage caused by the trimming tool.

5. When soldering semiconductor devices and all small components, be sure to use a heat sink tool or long-nosed plier connected to the component lead(s) while each is being soldered. Allow the soldered connection to cool before removing the heat sink.
6. Clean all dirt and solder-flux from the printed circuit traces by liberal application of isopropyl alcohol or freon-type solvents.

CHAPTER 1

GENERAL DESCRIPTION

1.1 BASIC FUNCTIONS

The Model 8181 Remote Time Display unit is designed to increase the flexibility and expand the capabilities of the Systron-Donner 8000 Series Time Code and Tape Search equipment.

The two basic Remote Time Display units can provide remote time-of day readouts with either six or nine digit resolution and a choice of three different size displays for maximum operator convenience. The Model 8181-6 provides a 6-digit display of hours, minutes, and seconds. The Model 8181-9 provides a 9-digit display of days, hours, minutes, and seconds.

1.2 APPLICATION

The Model 8181 is essentially a Time Code Translator which will accept a serial BCD code on an amplitude modulated 1 kHz carrier (or other carriers as appropriate for the time code involved). The Model 8181 converts the serial BCD information into parallel BCD form which is displayed on numerical indicator tubes and which is available (optionally) on a connector.

These displays are particularly valuable where time must be displayed at points widely separated over long distances. The advantages of running a single coaxial line to these displays as opposed to other methods of running 20 or more parallel lines of BCD information is obvious. Moreover, these display units may be used over long distances without being

concerned with voltage drops and larger cable size usually associated with running parallel BCD cables.

Additionally, the Model 8181 may, as a factory option, be supplied as a remote display unit for equipments other than the Systron-Donner 8000 Series.

Remote monitoring of the same data at several points is possible with additional units. The instrument can be used in many applications where duplication of remote time information is required.

1.3 STANDARD FEATURES

The Model 8181 is designed for simple, reliable operation and ease of maintenance. Its circuitry is designed to make full use of integrated circuits whenever possible and is constructed on printed circuit plug-in modules.

All circuitry required to decode the serial BCD (Binary Coded Decimal) input code and operate the decimal display is internal to the instrument. The display unit includes a self-contained power supply which operates from 117/230 volts, 48 to 440 Hz, 15 watts and requires no power from the signal source.

Front panel displays utilize in-line neon-glow numerical indicators mounted behind a polarized filter to reduce glare, and lighted colons are provided between time elements to reduce the probability of misinterpretation.

1.4 SPECIFICATIONS

Display

The 8181-6 has six digit in-line readout to indicate time of day in hours, minutes and seconds. The 8181-9 adds three digits of days to display time of year. Super size numerical indicator tubes (0.808 inch character height) are used. Standard size (0.610") or large size (1.375") are available optionally.

Code Format

The 8181 Series accepts a single line input of serial BCD code in IRIG B format. Other code formats are available optionally.

Input

A modulated code can be accepted in the forward direction with a carrier frequency from 80 Hz to 12 kHz with modulation ratios (mark-to-space) between 2:1 and 6:1. Input levels of -20 dbm to +10 dbm (0.25 to 7.5 volts peak-to-peak) can be decoded. The input is floating and has a bridging impedance at 1 kHz of greater than 10 kohms. DC input resistance is infinite. Provision for line termination is available.

Outputs (Optional):

Parallel BCD output is available to provide updated time in time of day or time of year.

Code: 8-4-2-1

Logic: Binary "1" = 5 (± 0.5) volts, 6 kohm source
Binary "0" = 0 (± 0.5) volts, 10 mA sink

Connector: Rear Panel Amphenol 57-40500

Manual Controls

Rear Panel ON-OFF toggle switch.

Environment

0° to 60° at up to 95% relative humidity.

Power

117/230 volts ($\pm 10\%$) 48 to 440 Hz, 15 watts.

Dimensions

3-1/2" h x 19" w x 8-1/2" d (8.9 x 48.3 x 21.6 cm). Removable rack handles.

Weight

7 lbs (3.2 kg) net, 9 lbs (4.1 kg) shipping.

Super-size display indicators are provided with a character height of 0.808 inches and a rated viewing distance of 38 feet. The viewing distance can be increased to 65 feet with optional large size indicators.

The unit requires 117/230 volts, 48 to 440 Hz, 0.15 ampere, 15 watts. Power is supplied to the instrument via a rear panel connector (cable supplied).

1.5 MODELS AVAILABLE

Model 8181-6 Six digit display indicating hours, minutes,

and seconds. Super-size display tubes (0.808 inch character height). Coax or twisted pair time code input via BNC connector with 2nd BNC connector provided for termination.

Model 8181-9 Nine digit display indicating days, hours, minutes, and seconds. Super-size display tubes (0.808 inch character height). Coax or twisted pair time code input as above.

1.6 OPTIONS

Option M16: All-angle swivel adapter yoke for wall or ceiling mount.

Option M17: Replace super-size display tubes with standard size display tubes (0.610 inch character height, 28 feet viewing distance).

Option M19: Replace super-size display tubes with larger size display tubes (1.375 inch character height, 65 feet viewing distance). This option is not available with the Model 8181-9.

1.7 PACKAGE

The Model 8181 Series Remote Displays are packaged in a 3-1/2 inch high panel which complements all of the new Systron-Donner 8000 Series timing units. The display is designed to mount in any standard 19 inch instrument cabinet. Removable rack handles allow the display to be operated on a bench top. In addition, an optional all-angle swivel yoke allows mounting the display on wall or ceiling. Package depth is 6 inches (15.2 cm).

CHAPTER 2

INSTALLATION

2.1 INITIAL INSPECTION

As soon as the instrument is received, verify that it is intact and as ordered. Inspect the instrument for damage and if any shipping damage is found refer to the warranty inside the rear cover of this manual, and to subsection 2.2 for repackaging and shipping instructions.

As soon as possible, the instrument should be installed and given a thorough electrical inspection. Should the instrument fail to operate properly or fail to meet the listed specifications, immediately contact your Systron-Donner representative.

2.2 STORAGE AND RESHIPMENT

Environmental conditions during storage and shipment should be limited as follows:

Maximum Temperature: 185°F (85°C)

Minimum Temperature: -69°F (-55°C)

To protect your instrument during shipment or storage, use the best packaging methods available. Your Systron-Donner field office can provide materials similar to those used for original factory packaging. Contract packaging companies can provide dependable packaging on short notice.

General packaging instructions:

- (1) Wrap the instrument in heavy paper or plastic before

placing it in the shipping container.

- (2) If possible, use the original container designed for the instrument. Otherwise, use a strong carton (350 lb./sq. in. bursting strength) or a wooden box to house the instrument.
- (3) Use plenty of packaging material around all sides of the instrument and protect the front panel with cardboard strips.
- (4) Seal the package with strong tape or metal bands. Mark the package with "DELICATE INSTRUMENT".
- (5) Refer to the warranty inside the rear cover of this manual and check with your Systron-Donner field office for shipping instructions. All correspondence should refer to the instrument by its model number and full serial number.

2.3 POWER REQUIREMENTS

The Model 8181 can operate from 115 V or 230 V $\pm 10\%$, 48 to 440 Hz, 15 watts. The unit is normally supplied for 115 volt operation.

To adapt the Model 8181 to 230 volt operation, remove the jumper wire between pins 1 and 2 and also pins 3 and 4 of the main power transformer (T1). Install a jumper wire between pins 2 and 3 of the main power transformer.

CAUTION

Disconnect all power from the unit before changing voltages.

2.4 YOKE MOUNTING

The instrument is normally supplied for bench top or rack mounted operation. If yoke mounting is desired (option M16) the following steps are necessary:

- (1) If supplied for rack mount, remove the rack mounting ears.
- (2) Drill three holes in mounting surface to accomodate yoke base, and bolt the base into position.
- (3) Insert the unit into the yoke fork and attach the unit to the fork with two wing bolts (supplied).
- (4) Insure that enough slack is present in the signal cable and power cord to allow the unit to rotate a full 360 degrees.

2.5 INSTALLATION

Mount as desired, connect to the proper power source (refer to 2.3), and make the interconnection between the Model 8181 and the signal source.

CHAPTER 3

OPERATION

3.1 GENERAL

Since the Model 8181 is a fully automatic instrument, no preliminary adjustments are required and no operator controls are provided.

The only step necessary to bring the unit to a fully operational condition is to turn the rear panel power switch OFF, install the signal cable and power cord, and turn the power switch to ON.

3.2 OPERATING CONDITIONS

Operating temperatures should be limited as follows:

Maximum Temperature: 140° F (60°C)

Minimum Temperature: 32°F (0°C)

CHAPTER 4

MAINTENANCE AND CALIBRATION

4.1 FACTORY SERVICE

Whenever the instrument requires service the nearest Systron-Donner representative should be contacted. He can provide field service or arrange for factory returns when necessary. Address all inquiries on operation or applications to your nearest sales representative, or to:

Sales Manager
Data Products Division
Systron-Donner Corporation
888 Galindo Street
Concord, California 94520

Specify both model and complete serial number in all correspondence.

4.2 ROUTINE MAINTENANCE

A regular program for routine maintenance and inspection every twelve months is recommended for this unit. As part of these regular procedures, the instrument should be checked in the following manner:

- (1) Disconnect ac power and remove the top and bottom covers.
- (2) Make a thorough visual inspection of all wiring and cables.
- (3) Check for physical integrity of all components. Look for burned or cracked components, loose solder connections, leakage of insulation compounds, and general physical damage. When a printed circuit board contains integrated circuit packages, ensure that all packages are firmly mounted. Never

unnecessarily remove and replace a package.

- (4) Check all rear panel switches and connectors for loose or broken terminals, loose or sticking shafts, etc.
- (5) If the internal panel surfaces and components have an excessive amount of dust deposited on them, use a soft brush and a low pressure stream of air to remove the foreign material.

CAUTION

Do not clean PC boards or small internal components with a stiff brush or solvents, since damage to the circuits may result. A high-powered vacuum cleaner device should not be used on small internal components.

- (6) Wipe the external surfaces of the instrument with a soft damp cloth to remove dirt, fingerprints, and other foreign material.
- (7) Clean the polarizing filter window only with a soft cloth and warm, soapy water: ABRASIVES OR SOLVENTS WILL DAMAGE THE FILTER. If desired, the filter may be removed for cleaning (remove trim and slide the filter out the end). The surfaces of the indicator tubes may be cleaned with a damp cloth at this time.
- (8) Perform the Operational Test and Calibration Procedure (Paragraph 4.5). If performance does not match or exceed the specifications listed in Chapter I of this manual, corrective maintenance is in order.

4.3 PRINTED-CIRCUIT BOARD REPAIR

To remove a part on a printed circuit board, cut the leads of the part near the lead holes. Using a low power (50 watts or less) soldering iron, apply heat sparingly to each cut lead. As soon as the solder melts, slip the lead from the hole and clean the hole with a toothpick. Clean the board surfaces with isopropyl alcohol. Form the tinned leads of the replacement part and insert in cleaned holes, trimming the leads to extend 1/16 inch beyond the back surface of the board. Only 63/37 solder with a maximum diameter of 1/16 inch should be used. Solder the leads to the board and use a hemostat, long-nosed pliers, or other heat sink on the leads of all semiconductor devices and quarter-watt resistors. Allow the soldered junction to cool before removing the heat sink.

Integrated circuit packages are best removed by carefully melting the solder around each pin and sucking it out with a vacuum device from the backside of the board. After the solder has been removed from all pins, carefully loosen each pin with needle nose pliers, then lift out the package.

4.4 LOGIC FUNCTIONS

The logic symbols and functions, as used in the Model 8181, are described in the following paragraph. Truth tables and detailed explanations are given where necessary in order to assist qualified maintenance personnel in the repair and upkeep of the instrument.

AND Gate



OR Gate



NAND Gate



INVERTED OR Gate



The NAND Gate and the INVERTED OR Gate have the same truth tables.

A	B	C
0	0	1
0	1	1
1	0	1
1	1	0

NOR Gate



INVERTED AND Gate



The NOR Gate and the INVERTED AND Gate have the same truth tables.

A	B	C
0	0	1
0	1	0
1	0	0
1	1	0

DOT AND

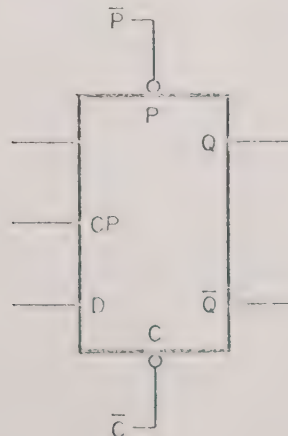


DOT OR



In some configurations it is possible to perform the AND and OR function simply by tying the outputs of certain gates together. These functions are called DOT AND and DOT OR functions.

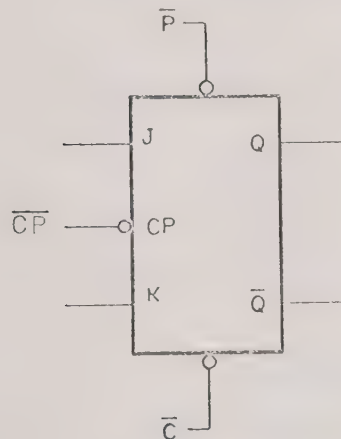
D-TYPE Flip-Flop



- (1) Q assumes the state of the D input on the positive transition of the clock (CP) input.

- (2) The D input is locked out when the clock input is positive.
- (3) $\overline{P}$ and $\overline{C}$ override all other inputs.
- (4) If $\overline{P}$ and $\overline{C}$ are both at Logic 0, the Q and $\overline{Q}$ outputs are both at Logic 1.
- (5) At preset condition, Q is a Logic 1. At a clear condition Q is a Logic 0.

JK-TYPE Flip-Flop



$$J = J1 \cdot J2 \cdot J3$$

$$K = K1 \cdot K2 \cdot K3$$

- (1) If J and K are both at Logic 0 when the clock input ($\overline{CP}$) assumes a Logic 0 state there is no change in the output.
- (2) If K is a Logic 1, Q will assume a Logic 0 when $\overline{CP}$ goes to Logic 0.
- (3) If J is a Logic 1, Q will assume a Logic 1 when $\overline{CP}$ goes to Logic 0.
- (4) If J and K are both at Logic 1 the flip-flop will change state when $\overline{CP}$ goes to Logic 0.
- (5) The J and K inputs are locked out when the clock input is Logic 0.

- (6) $\overline{P}$ and $\overline{C}$ override all other inputs.
- (7) If $\overline{P}$ and $\overline{C}$ are both at Logic 0 the Q and $\overline{Q}$ outputs are both at Logic 1.
- (8) At a preset condition, Q is a Logic 1. At a clear condition, Q is a Logic 0.

4.5 OPERATIONAL TEST AND CALIBRATION PROCEDURE

In the event of an equipment malfunction the following circuit description and adjustment procedure, if followed in the listed sequence, will allow the technician to isolate the trouble to a particular circuit card.

When the trouble is isolated to a card, the card description in Chapter 6 will facilitate repair.

WARNING

Dangerous high voltages are present in the power supply and display circuits of this equipment. Use caution at all times when the protective covers are removed.

4.5.1 RECOMMENDED TEST EQUIPMENT

The following test equipment or equivalent is recommended for use in servicing the Model 8181.

<u>Model</u>	<u>Manufacturer</u>	<u>Description</u>
531A	TEKTRONIX, INC.	Oscilloscope 15 MHz Bandwidth triggered sweeps from 0.1 microseconds/cm to 5 sec/cm.

TEST EQUIPMENT (cont)

<u>Model</u>	<u>Manufacturer</u>	<u>Description</u>
CA	TEKTRONIX, INC.	Dual-Trace Calibrated preamp for 531A scope, 0.05 volts/cm to 20 volts/cm.
P6000	TEKTRONIX, INC.	Probe, 10:1 Attenuation Ratio, 12 pf capacitance.
9000	SYSTRON-DONNER CORP.	VOM, 10 M Ω input impedance, $\pm 0.1\%$ accuracy.
8150	SYSTRON-DONNER CORP.	Time Code Generator

In place of the Model 8150 listed above, a suitable source of input signals of known characteristics may be used. This may be another Time Code Generator or a pre-recorded tape and tape playback equipment.

4.5.2 POWER SUPPLY REGULATOR (Dwg. #21757-7-2)

Adjust the following voltages on the regular board:

<u>Voltage</u>	<u>Adjust</u>	<u>Test Point</u>
+5 V dc ± 0.5 V	R2	Terminal 7

If the Power Supply Regulator card is operating normally and the Power Supply voltages are correct the above voltages may be obtained with very little difficulty. If the voltages will not adjust properly or fail to maintain their regulation, corrective maintenance is in order.

CHAPTER 5

OVERALL FUNCTIONAL DESCRIPTION

5.1 GENERAL

The Model 8181-6 Wiring Block Diagram Dwg. #31134-7-1 depicts the complete instrument and is used for this Functional Description which applies equally to the Model 8181-9. The Model 8181-9 is identical to the Model 8181-6 except for number of digits readout.

Additional reference drawings are as called out on 31134-7-1.

5.2 FUNCTIONAL

J2 and J3 are the input connectors for the modulated code input. These are connected in parallel and can be used as a T junction to connect several instruments to one source generator or to terminate a transmission line.

The input is transformer-coupled to the AGC and Cycle Detector card A8. This provides isolation and allows for the use of balanced lines. The signal level input should be as specified in 1.4.

The AGC and Cycle Detector module automatically adjust the amplitude of the signal to the Cycle Detector circuits so the instrument can operate with inputs from 250 millivolts to 7.5 volts peak-to-peak.

The cycle detector circuits separate the modulated code into two output signals to drive the reader logic module A7. These signals are the $\overline{EC}$ (not each cycle) and $\overline{LC}$ (not large cycle).

The operation of the Reader Logic circuits is as follows:

First the double mark that indicates the beginning of the time frame is detected and the shift register is cleared. Then a ONE set is the first position. Then each BCD bit of the code is detected and shifted into the register. When the ONE that was set in the first position reaches the eight position, a circuit is set which says, after the next shift signal transfer the information in the shift register to the seconds portion of the Time Accumulator. When the next mark is detected, the shift register is again cleared and a ONE set in the first position, and the "Y" counter counted to one (so that the next eight bits can be transferred to the minutes portion of the Time Accumulator). Then the process of shifting in eight bits and transferring to storage is repeated. This same cycle is repeated for the hours information. After the hours have been transferred to storage, the "Y" counter continues to count thru 9 and then recycles to zero, producing the Accumulator Update pulse. The "Y" counter is synchronized by resetting to zero when the double mark is detected.

The Time Accumulator consists of two divide-by-sixty counters

(Seconds & Minutes) followed by a divide-by-24 counter with three divide-by-ten (Days) counter added in the case of the 8181-9. These counters may be loaded in parallel from the shift register in the Reader Logic or one second may be added by applying the Update Pulse from the Reader Logic. The use of the Update Pulse insures an On Time Display. The BCD outputs of the Time Accumulator are applied to the front panel display and are brought out (optionally) to a connector on the rear panel.

CHAPTER 6
CIRCUIT DESCRIPTION

TABLE 6-1
CARD LOCATION

<u>Location</u>	<u>Card</u>
A1	Blank
A2	Blank
A3	Blank
A4	Days Accumulator (Model 8181-9 only)
A5	Extender Board
A6	Time-of-Day Accumulator
A7	Reader Logic
A8	AGC & Cycle Detector

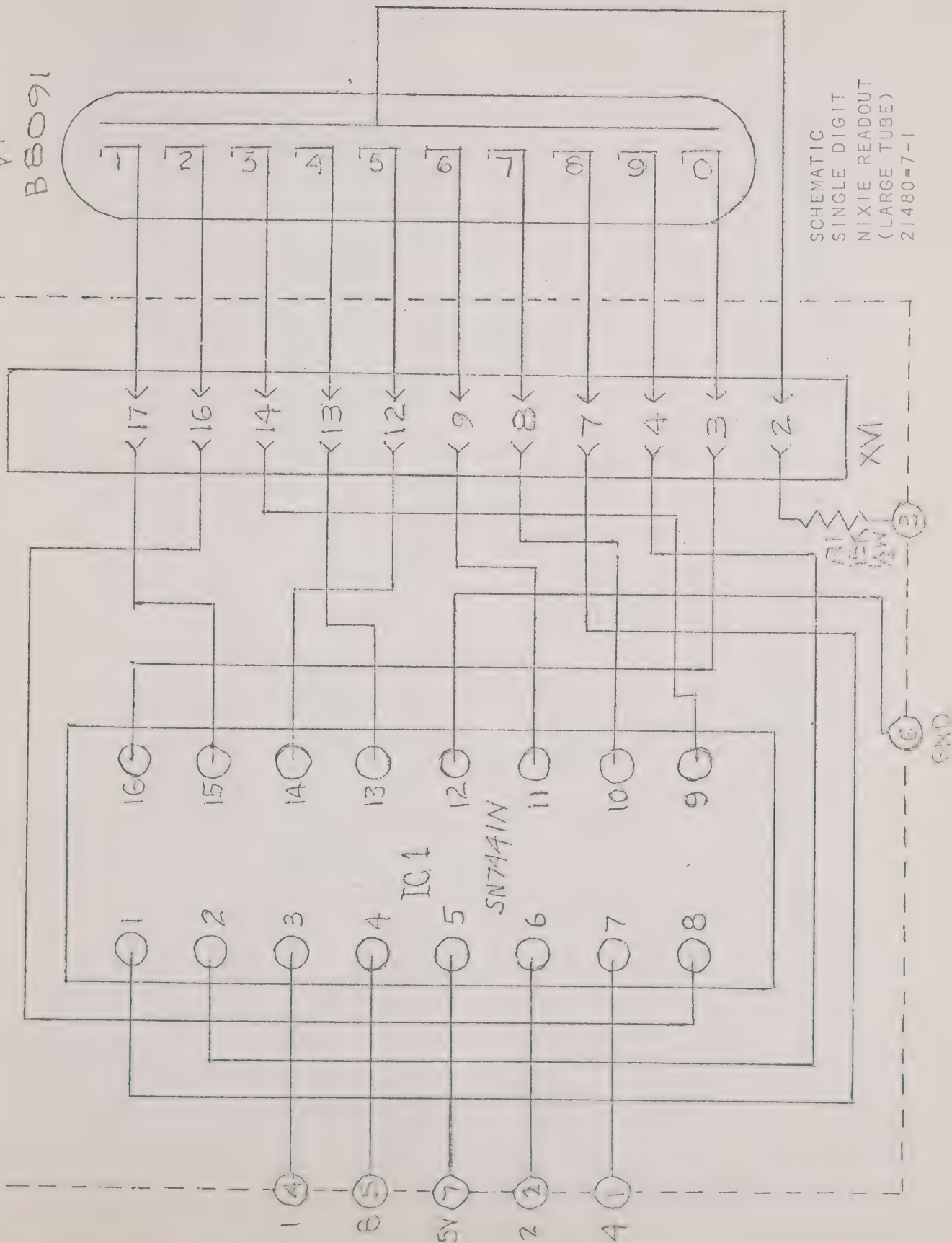
All plug-in modules are designed so that the card will only fit into position if it is correctly aligned; however, caution must be exercised to insure that a card is installed in the correct card slot. Latching handles on all cards are numbered to facilitate correct installation.

CAUTION

When mounting a card on the extender board it is possible to install the card backwards which will result in serious damage.

21480-4-1

V1
B8091



SCHEMATIC
SINGLE DIGIT
NIXIE READOUT
(LARGE TUBE)
21480-7-1

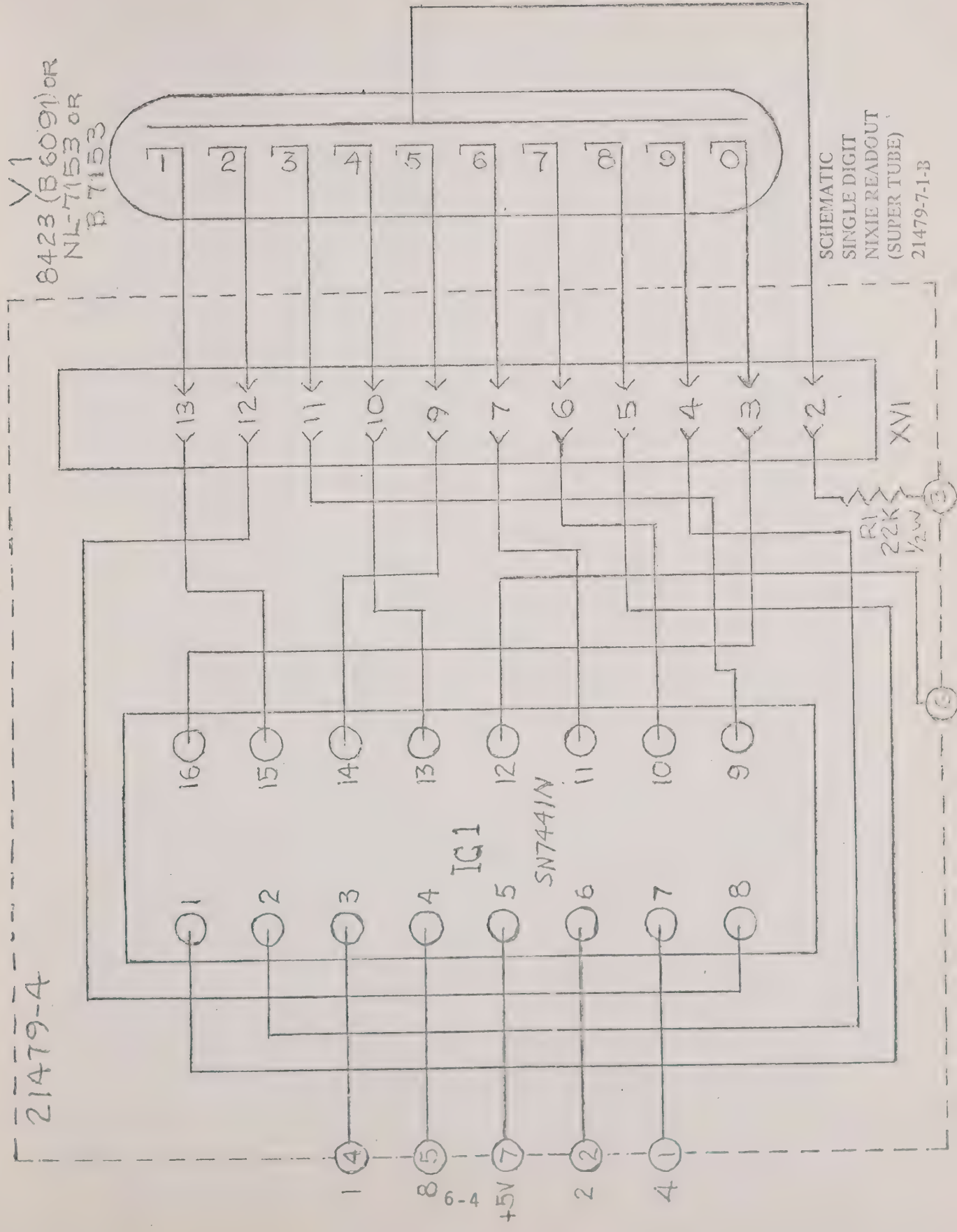
6.6 CHASSIS ASSEMBLY 8181-6

PARTS LIST

<u>Ref.</u>	<u>Description</u>	<u>S-D Part No.</u>
	FRONT PANEL	D21751-1-1
	Window, Polaroid	B21754-1-1
	REAR PANEL	C31395-1-1
C2	Capacitor, 10 μ f, 450 V	C0337
C3	Capacitor, 2500 μ f	C1148
C4	Capacitor, 2 μ f, 100 V	C0744
F1	Fuse, 0.25A SB	F0067
J2,3	Connector BNC.	J0165
Q2	Transistor, 2N4921	Q0267
R1	Resistor, 220 k Ω , 1/2 W, 5%	R0264
S1	Switch SPDT 8363K7	S0073
S2	Switch (IRIG A - IRIG B)	S0149
T1	Transformer	25294
	Audio Transformer (UTC-A15)	
	SINGLE DIGIT READOUT	D21753-1-1
	Assembly	21480-4-1
	Schematic	21480-7-1
	P.C. Socket National RTS-34	X0169
	IC TI SN7441N	I9707
R1	Resistor, 15 k Ω , 5%, 1/2W, CC	R0404
USECO 2000B	Terminal Bifurc.	E0100
VI	Tube Readout, B8091	V0109

V1
8423 (B6091) OR
NL-7153 OR
B7153

21479-4



SCHEMATIC
SINGLE DIGIT
NIXIE READOUT
(SUPER TUBE)
21479-7-1-B

6.7 CHASSIS ASSEMBLY 8181-9

PARTS LIST

<u>Ref.</u>	<u>Description</u>	<u>S-D Part No.</u>
	FRONT PANEL	21751-1-1
	Window, Polaroid	21754-1-1
	REAR PANEL	31395-1-1
C2	Capacitor, 10 μ f, 450 V	C0337
C3	Capacitor, 2500 μ f	C1148
C4	Capacitor, 2 μ f, 100 V	C0744
F1	Fuse, 0.25A SB	F0067
J2,3	Connector BNC	J0165
Q2	Transistor, 2N4921	Q0267
R1	Resistor, 220 k Ω , 1/2 W, 5%	R0264
S1	Switch SPDT 8363k7	A0073
S2	Switch (IRIGA - IRIGB)	S0149
T1	Transformer	25294
	Audio Transformer (UTC-A15)	
	SINGLE DIGIT READOUT	
	Assembly	21497-4-1
	Schematic	21497-7-1
	P.C. Socket, RTS-6	X0171
	IC T1 SN7441N	I9797
R1	Resistor, 22 k Ω , 5%, 1/2 W, CC	R0527
USECO 2000B	Terminal, Bifurc.	E0100
V1	Tube Readout NL6091	V0109

CIRCUIT DESCRIPTION
TIME-OF-DAY ACCUMULATOR
SCHEMATIC #21543-7

1) GENERAL

This card successively divides the 1 pps signal to provide outputs which represent seconds through hours. All outputs are buffered, an input inhibit circuit is provided, and the hours dividers are recycled at 23:59:59.

2) DIVIDERS

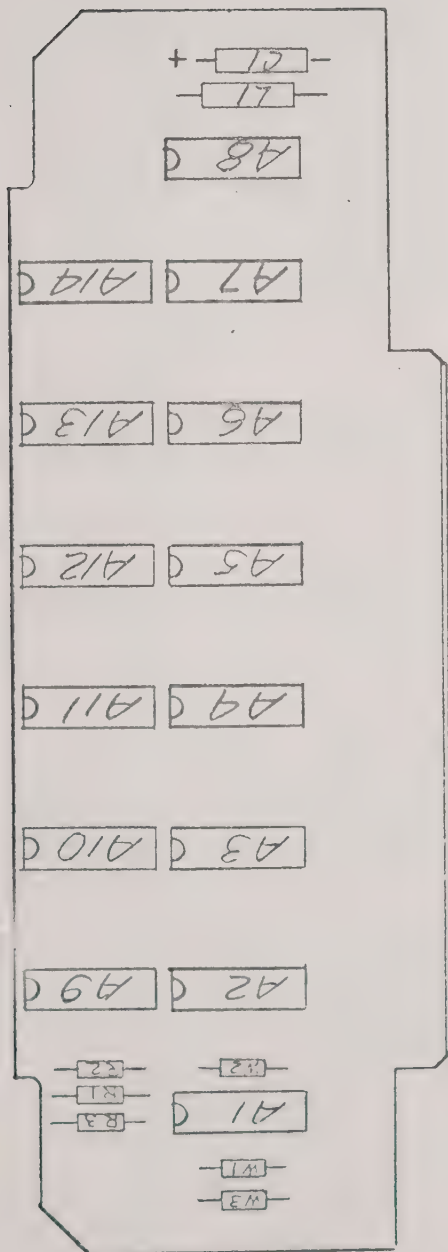
Dividers A2, A4, A6 and A7 divide by 10. Dividers A3 and A5 divide by 6. Each divider has its data inputs connected to the output of a preset thumbwheel switch. Grounding the appropriate preset line will load the preset time into the divider. Inverters A8 are used to buffer the seconds reset lines.

3) INHIBIT CIRCUIT

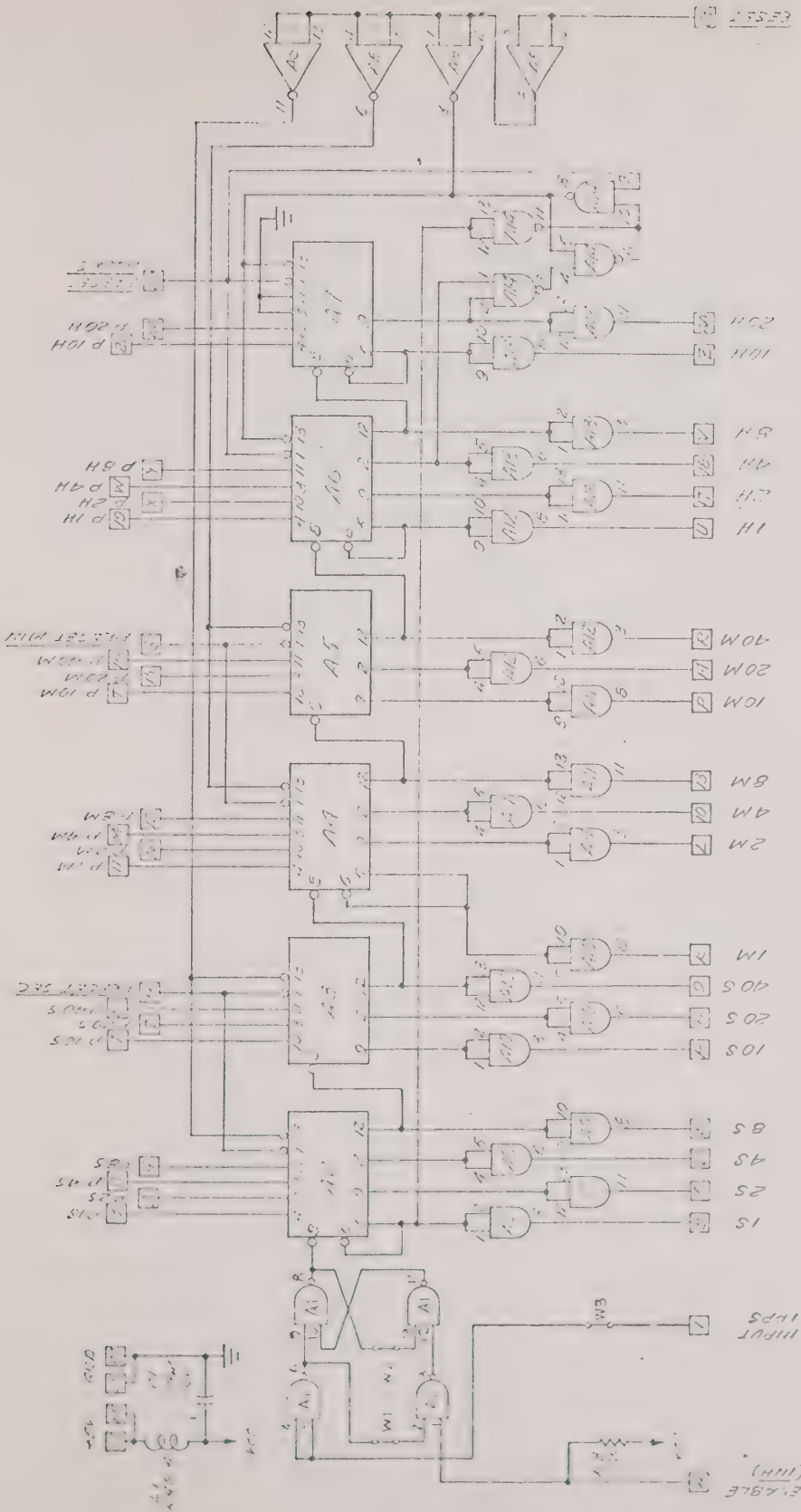
The inhibit circuit is used to stop updating of the accumulator when the front panel mode switch is in the HOLD position. Gate A1-6 inverts the 1 pps input. Gates A1-11/A1-8 form an RS flip-flop. Gate A1-3 inverts the INHIBIT line. When the accumulator is updating, A1-11/A1-8 output follows the 1 pps input. When the INHIBIT/ENABLE line, pin A, is grounded, the flip-flop will latch with the output high. The output will go low the first time the input is low after the ground has been removed from the INHIBIT/ENABLE line.

4) RECYCLE CIRCUIT

Gates A14-6/A14-8 are connected as an RS flip-flop to control the reset lines of dividers A6 and A7 for recycle at 23:59:59. Gate A14-3 ANDs the 20 hour and the 4 hour outputs to provide a low output at 24 hours. The flip-flop (A14-6/A14-8) output will also go low, resetting A6 and A7 at this time, provided the PRESET HOURS line is high. In this way, recycle is inhibited during preset. Gate A14-11 is wire AND-connected to the flip-flop and maintains the reset pulse for one second. This allows all the flip-flops in the dividers time to reset. Reset may also be initiated from the RESET line via A8-3.



TIME-OF-DAY ACCUMULATOR ASSEMBLY #B21543-4-2A



NOTES:

- 1) PIN 7 IS CONNECTED TO GND ON ALL I.C.'S.
- 2) PIN 14 " VCC " " "
- 3) A1, A4, A6, A7 ARE MC860A
- 4) A2, A3 ARE 74113-A
- 5) A5, A8 ARE MC840P
- 6) A1, A2, A3, A4, A9 ARE MC1626P

PARTS LIST
ACCUMULATOR #21543-7-2

REF.	DESCRIPTION	SD PARTS LIST
	Assembly, Accumulator	B21543-4-2
	Schematic, Accumulator	C21543-7-2
	P.C. Board	B21543-1-1
A1,8,14	Integrated Circuit, MC846P	19716
A2,4,6,7	Integrated Circuit, N8280A	25722
A3,5	Integrated Circuit, C2125-A	25723
A9-13	Integrated Circuit, MC1806P	25733
C1	Capacitor, 39 μ F, 10 V	C0902
C2,W1-3	Jumper, Molded	W0087
L1	Inductor, R45-4	L0143
R3	Resistor, 3.9 k, 1/4 W, 5%, CC	R0939
	Extractors	H1743

CIRCUIT DESCRIPTION
BUFFERED ACCUMULATOR/MINOR COUNTER
SCHEMATIC #21547-7

1) GENERAL

The Buffered Accumulator/Minor Counter card can provide up to three serial decades with common reset, parallel preset, and two sets of buffered, parallel BCD outputs. Provision is made to gate one set of BCD outputs in three 4-bit bytes. The input may be either ac or dc-coupled and fed to the first decade through an update inhibit circuit. A days recycle circuit can be added which may be programmed to reset the accumulator to 001 at the end of 365 or 366 days. Provision is included for three output pulse rates with 10% duty cycle which may be supplied in place of the buffer gate signals.

The card is used as a minor counter or days accumulator, among other applications. The following description is intended to apply to all card configurations. The specific assembly used is covered by the attached assembly, schematic and parts list.

2) DECADE DIVIDERS

The decade dividers (up to three) are connected in tandem. Each is provided with parallel BCD data inputs which load preset information when the associated data strobe (PRESET) line is grounded. Jumpers W1 and W2 permit the data strobe associated with the center decade (A4) to be wired in common with the data strobe input to the first decade (A1), or the third decade (A6). The decade zero reset inputs are wired in common through buffers on A8 to pin 23. The parallel BCD outputs from each decade are wired to output pins through two sets of buffers.

3) OUTPUT BUFFERS

The BCD output buffers may be inverting or noninverting. One of the two sets (A10, A13 and A15) can be gated by inputs through pins L, K and J, respectively. These gate lines are buffered by inverters on A11.

4) INPUT INHIBIT CIRCUIT

This circuit allows the presence of a ground on pin H to inhibit input signals on pin F from updating the accumulator. Gate A2-6 inverts and buffers the input. Gates A2-11 and A2-8 form an R-S flip-flop.

A2-3 gates the INHIBIT line and the inverted input. When the accumulator is updating, flip-flop A2-8,11 output follows the input. When

the INHIBIT line, pin H, is grounded the flip-flop will latch with the output high. The output will go low the first time the input is low after the ground has been removed from the INHIBIT line.

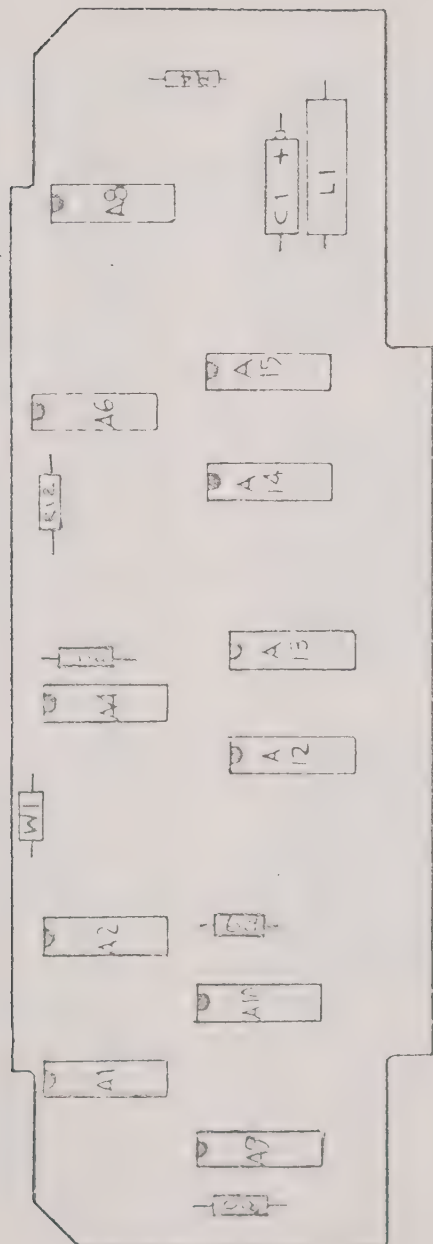
5) DAYS RECYCLE CIRCUIT

Gate A5-6 is a four-input NAND gate with an expander input. The connection of diodes CR1-CR3 gives the gate seven inputs. If recycle at 366 is desired, pin T is connected to Vcc. If recycle at 367 (for leap year) is desired, pin T is connected to pin 1 (the one-day output). Pin S is always connected to the two-day output. At the selected count, the output of A5-6 will go low triggering one-shot A8-11,6. The one-shot output is a negative-going pulse (from +5 to 0 V). The leading edge of the pulse (ac-coupled into A8-8) causes the three dividers to reset to 000. The trailing edge of the pulse (which is positive-going) is ac-coupled into A5-8 where it is inverted and used to input one count to the first decade. The resulting accumulator contents are 001.

6) OUTPUT PULSE RATES

Three sets of gates are used to produce three 10% duty cycle pulse rates. Each pulse goes high when the four outputs from the corresponding decades are low (leading edge on time). The pulse remains up until the output of the decade is 001. Thus, the pulse is high 10% of the time. The output is a 5 V logic level behind 6 k Ω .

The pulse rate outputs are fed to pins J, K and L which are used for gate inputs on other configurations of the card. Inverters A11 are removed when the rate outputs are supplied.

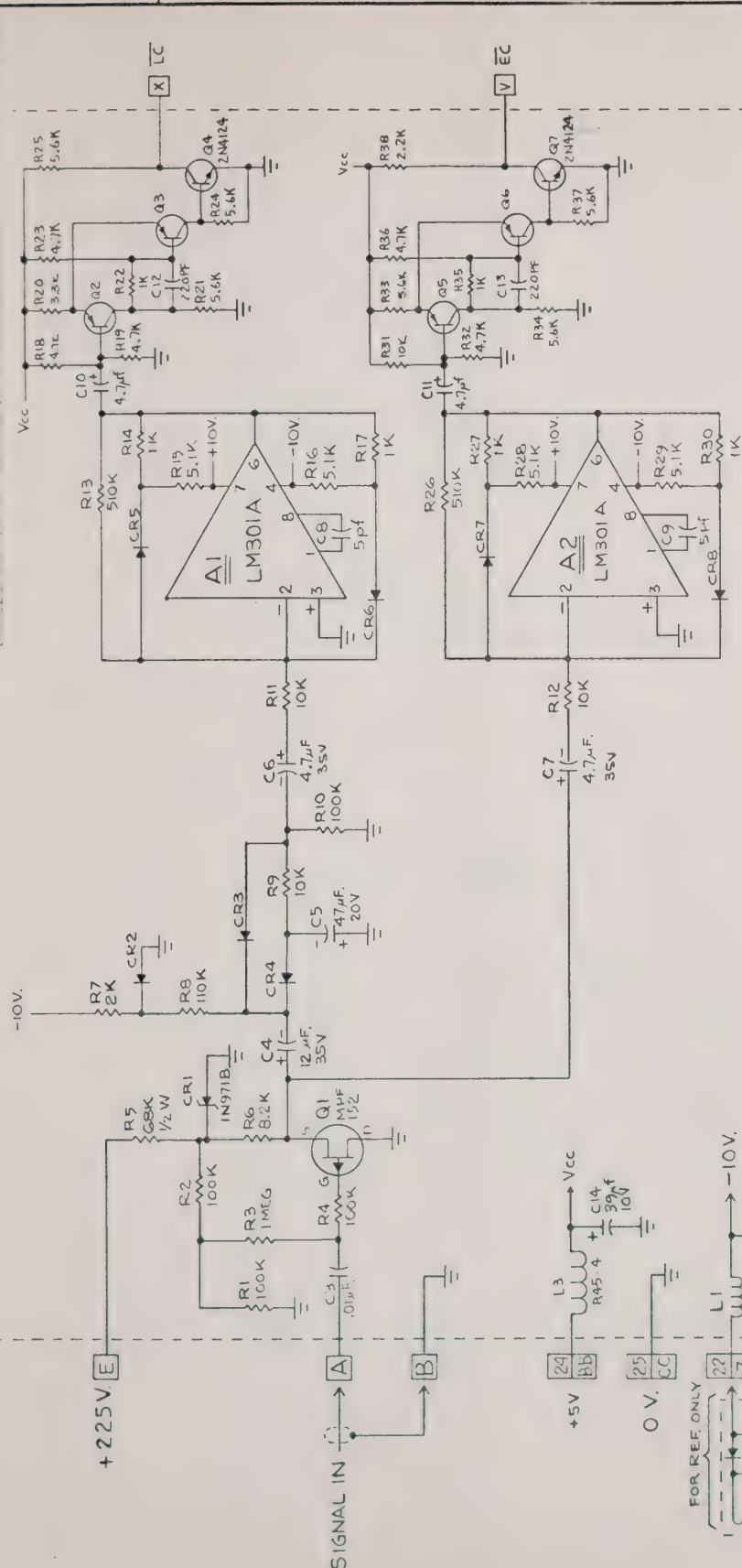


PARTS LIST
3 DIGIT ACCUMULATOR W/BUFFERS #21547-7-9

REF.	DESCRIPTION	SD PART NO.
	Assembly	A21547-4-9
	Schematic	A21547-7-9
A1,4,6	Integrated Circuit, N8280A	25722
A2	Integrated Circuit, MC846P	19716
A8	Integrated Circuit, SN7400N	19705
A9,10,12-15	Integrated Circuit, MC1806P	25733
C1	Capacitor, 39 μ F, 10 V, Tant	C0902
L1	Inductor, R45-4	L0143
R4	Resistor, 3.9 k, 1/4 W, 5%	R0939
R9-12	Resistor, 10 k, 1/4 W, 5%	R0766
W1	Jumper, Molded	W0087
	Extractor	H1743

REVISIONS					
ISSUE	DESCRIPTION	SER. NO.	ECO. NO.	DATE	APP. 1)

		DRAWN BY DATE CHECKED BY DATE ENG. DATE MESH DATE FINISH DATE APPROVAL DATE	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMAL TOLERANCE ± .01 ANGLES ± 1°	BYSTRON  DONNER CORPORATION CONCORD, CALIFORNIA	AGC & CYCLE DETECTOR
CAT. NO.	QUANTITY	PRICE	DATE	BY	DWG. NO. 21574-4-1
DESIGN	NET WT.	NET WT.	DATE	BY	
APPROVAL					

[illegible]

NOTE: UNLESS OTHERWISE SPECIFIED,
1) ALL DIODES ARE 1N4148
2) ALL DIODES ARE TYPE 1N4148
3) ALL TRANSISTORS ARE 2N4126

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PARTS LIST
AGC & CYCLE DETECTOR #21574-7-1

REF.	DESCRIPTION	SD PART NO.
	Assembly	21574-4-1
	Schematic	21574-7-1
A1,2	Integrated Circuit, LM301A	25745
C1	Capacitor, 39 μ F, 20 V	03279750
C2	Capacitor, 100 μ F, 20 V	C0832
C3	Capacitor, .01 μ F, 500 V	C0423
C4	Capacitor, 12 μ F, 35 V	C1275
C5	Capacitor, 47 μ F, 20 V	C0924
C6,7,10,11	Capacitor, 4.7 μ F, 35 V	C0406
C8,9	Capacitor 5 pF, DM15	C1071
C12,13	Capacitor, 220 pF, DM15	C1077
C14	Capacitor, 39 μ F, 10 V, 150D	C0902
CR1	Diode, 1N971B	CR0229
CR2-8	Diode, 1N4151	CR0150
L1-3	Inductor, R45-4	L0143
Q1	Transistor, MPF152	Q0263
A2,3,5,6	Transistor, 2N4126	Q0248
A4,7	Transistor, 2N4124	Q0247
R1,2,4,10	Resistor, 100 k 5%, 1/4 W, CC	R0741
R3	Resistor, 1 M, 5%, 1/4 W, CC	R0962
R5	Resistor, 68 k, 5%, 1/4 W, CC	R0273
R6	Resistor, 8.2 k, 5%, 1/4 W, CC	R0883
R7	Resistor, 2 k, 5%, 1/4 W, CC	R0734
R8	Resistor, 110 k, 5%, 1/4 W, CC	R1010
R9,11,12,31	Resistor, 10 k, 5%, 1/4 W, CC	R0766
R13,26	Resistor, 510 k, 5%, 1/4 W, CC	R0968
R14,17,22,27, 30,35	Resistor, 1 k, 5%, 1/4 W, CC	R0765
R15,16,28,29	Resistor, 5.1 k, 5%, 1/4 W, CC	R0693
R18,19,23,32,36	Resistor, 4.7 k, 5%, 1/4 W, CC	R0892
R20	Resistor, 3.3 k, 5%, 1/4 W, CC	R0742
R21,24,25,33, 34,37	Resistor, 5.6 k, 5%, 1/4 W, CC	R0749
R38	Resistor, 2.2 k, 5%, 1/4 W, CC	R0749
	Extractor	H1743

CIRCUIT DESCRIPTION
IRIG READER LOGIC
SCHEMATIC #21588-7

1) GENERAL

The IRIG Reader Logic card accepts the Lower Large Cycle (LLC) and Each Cycle (EC) signals from the AGC and Cycle Detector and detects the ONES, ZEROS and MARKS in the code. It sorts out the BCD time information and loads it into a shift register in two-digit bytes. These data are transferred, in parallel, to the Time Accumulator by Strobe signals generated on the card.

A number of card configurations are possible involving arrangements where selected signals are outputted for external use. The following description is intended to apply to all card configurations. The specific assembly used is covered by the attached assembly, schematic and parts list.

2) FUNCTION

The basic scheme of operation is as follows:

When a MARK is detected, the nine-bit shift register (A14) and 1/2 (A13) is cleared and a ONE set in the first bit position. Also, the "Y" counter A10 is advanced one.

When the second MARK of the double MARK is detected, the sequence is changed so that the "Y" counter is set to ZERO if it was not already at ZERO. It is not advanced for this MARK. Nor is the shift register cleared. However, the ONE that was entered by the first MARK is shifted one position. The shift register is now advanced one position for each binary bit of the time frame. When the ONE that was entered by the first MARK reaches the ninth position, a circuit is set which permits the next shift signal to transfer the information from the register to the seconds section of the Time Accumulator.

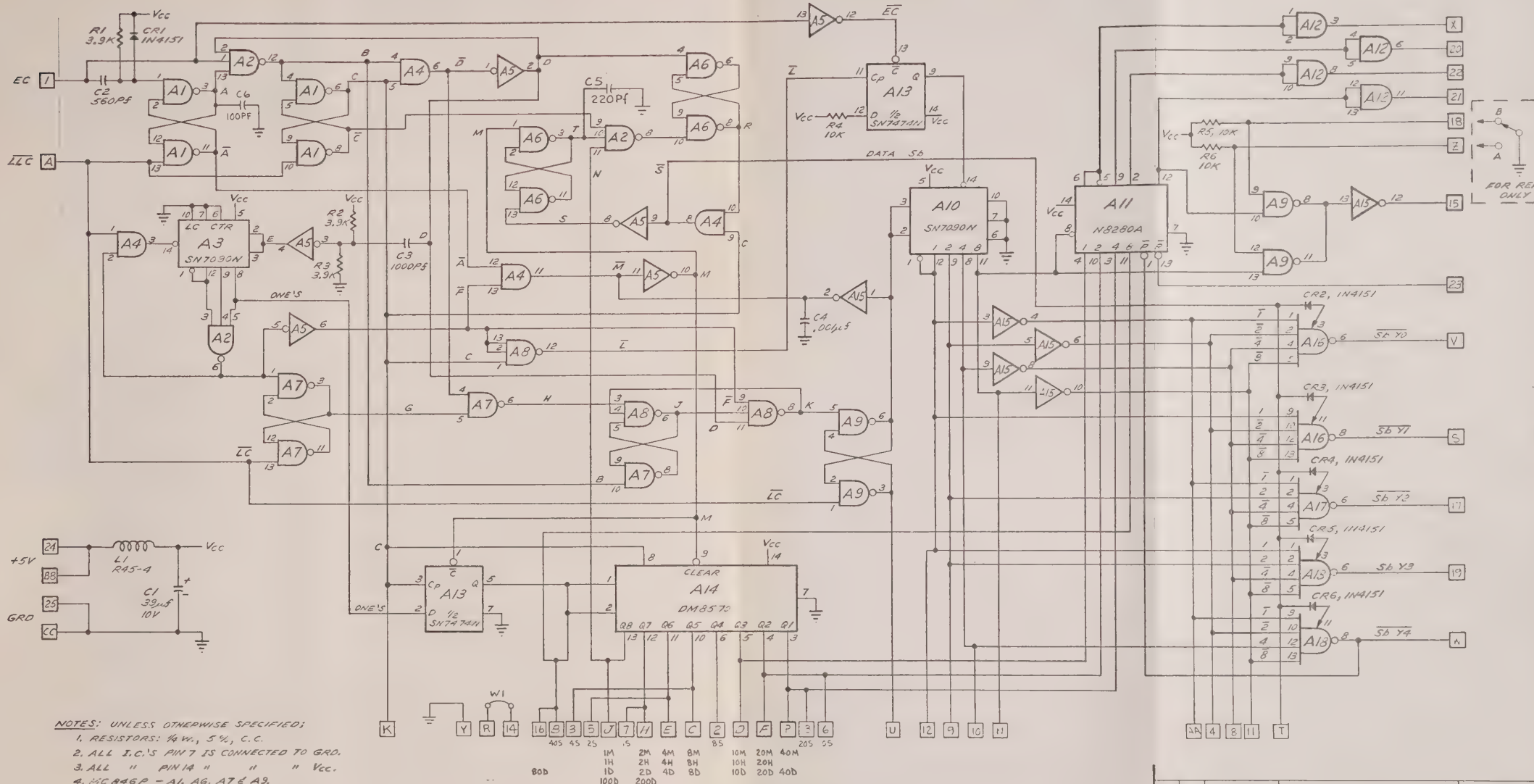
When the next MARK is detected, the register is cleared, a ONE entered and the "Y" counter advanced one. After nine bits are shifted into the register the information is transferred to the minutes section of the Accumulator. This cycle of operation is repeated a third time for hours information. If Days are included, two additional cycles transfer this information to the Accumulator. The "Y" counter continues to count MARKS throughout the time frame.

When the first MARK of the next double MARK is detected, it steps the "Y" counter from 9 to zero advancing the Time Accumulator one second. It is thus updated at the beginning of the frame and will contain the same information (assuming

no errors) scanned in during the frame. (The readout does not change during scan-in since the Accumulator is already updated.)

Provision is made through decade A11 and gates on A9, to select 1 pps at pin 15 for the IRIG A and IRIG B codes. Decade A11 is synchronized with the tenths-of-seconds in the IRIG A code by the $\overline{SbY4}$ output from A18-8. Tenths-of-seconds are then available at the outputs from A12.

Jumpers are provided to output the ONES signal from A3-8 (pin R), the Clear signal (M) from A4-11 (pin 14) and the Y-Counter input signal from A13-9 (pin M).



REV	DESCRIPTION	REV NO	REV DATE	REV BY
1	REVISION 1	1	1	1
2	REVISION 2	2	2	2

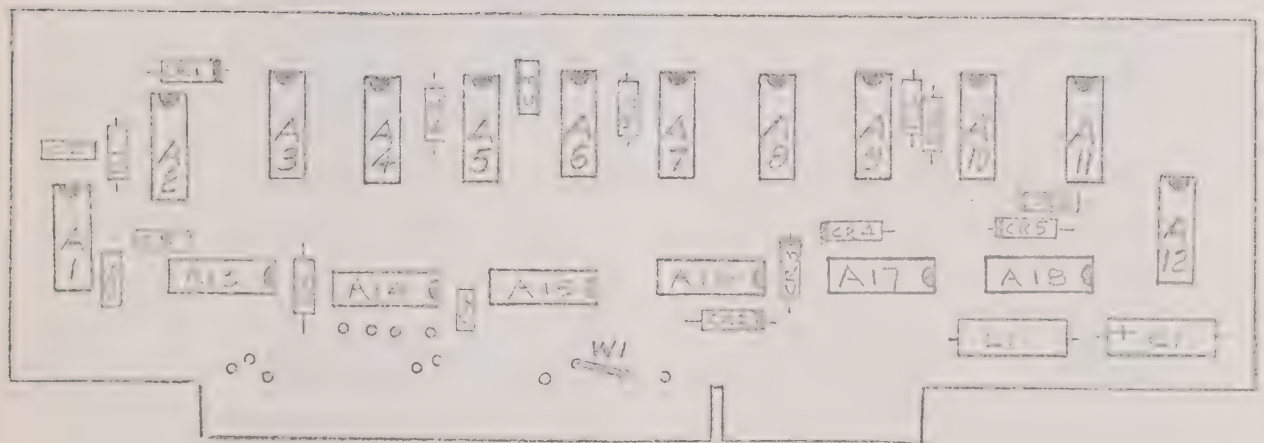
ITEM NO	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF NO
LIST OF MATERIALS				
1	1	MC846P	IC	
2	1	MC862P	IC	
3	1	MC1806P	IC	
4	1	MC836P	IC	
5	1	MC830P	IC	
6	1	555	IC	
7	1	555	IC	
8	1	555	IC	
9	1	555	IC	
10	1	555	IC	
11	1	555	IC	
12	1	555	IC	
13	1	555	IC	
14	1	555	IC	
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16	1	555	IC	
17	1	555	IC	
18	1	555	IC	
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20	1	555	IC	
21	1	555	IC	
22	1	555	IC	
23	1	555	IC	
24	1	555	IC	

ITEM NO	QTY	PART NUMBER	DESCRIPTION	SCHEMATIC REF NO
LIST OF MATERIALS				
1	1	MC846P	IC	
2	1	MC862P	IC	
3	1	MC1806P	IC	
4	1	MC836P	IC	
5	1	MC830P	IC	
6	1	555	IC	
7	1	555	IC	
8	1	555	IC	
9	1	555	IC	
10	1	555	IC	
11	1	555	IC	
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13	1	555	IC	
14	1	555	IC	
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23	1	555	IC	
24	1	555	IC	

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REVISIONS		REV. NO.	DATE	BY
A	REVISED PER LCD 416			
B	REVISED PER RW CHANGE ADD W1			
C	ADDED KEY SLOT			



KEY SLOT BETWEEN
PINS 18 & 19

SYSTRON-DONNER CORPORATION CONCORD, CALIFORNIA	21518-41
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PARTS LIST
IRIG READER LOGIC #21588-7-1

REF.	DESCRIPTION	SD PART NO.
	Assembly	21588-4-1
	Schematic	21588-7-1
A1,6,7,9	Integrated Circuit, MC846P	19716
A2,8	Integrated Circuit, MC862P	19719
A3,10	Integrated Circuit, SN7090N	25732
A4,12	Integrated Circuit, MC1806P	25733
A5,15	Integrated Circuit, MC836P	25704
A11	Integrated Circuit, N8280A	25722
A13	Integrated Circuit, SN7474N	25241
A14	Integrated Circuit, DM8570	25751
A16-18	Integrated Circuit, MC830P	19712
C1	Capacitor, 39 μ F, 10 V	C0902
C2	Capacitor, 560 pF, Mica	C1079
C3	Capacitor, .001 μ F, DM15	C1144
C4	Capacitor, .001 pF, Disc	C0424
C5	Capacitor, 220 pF, DM15	C1077
C6	Capacitor, 100 pF, DM15	C0874
CR1-6	Diode, 1N4151	CR0150
L1	Inductor	L0143
R1-3	Resistor, 3.9 k, 5%, 1/4 W, CC	R0939
R4-6	Resistor, 10 k, 5%, 1/4 W, CC	R0766
	Extractor	H1743

CIRCUIT DESCRIPTION
POWER SUPPLY BOARD
SCHEMATIC #21757-7

1) GENERAL

This board contains rectifiers to provide the unregulated +225 V and approximately +10 V for the +5 V regulator. The first stage of the 5 V regulator is also on this board.

2) RECTIFIERS

Diodes CR1-CR4 provide unregulated and unfiltered +225 V. The filter is located off the board.

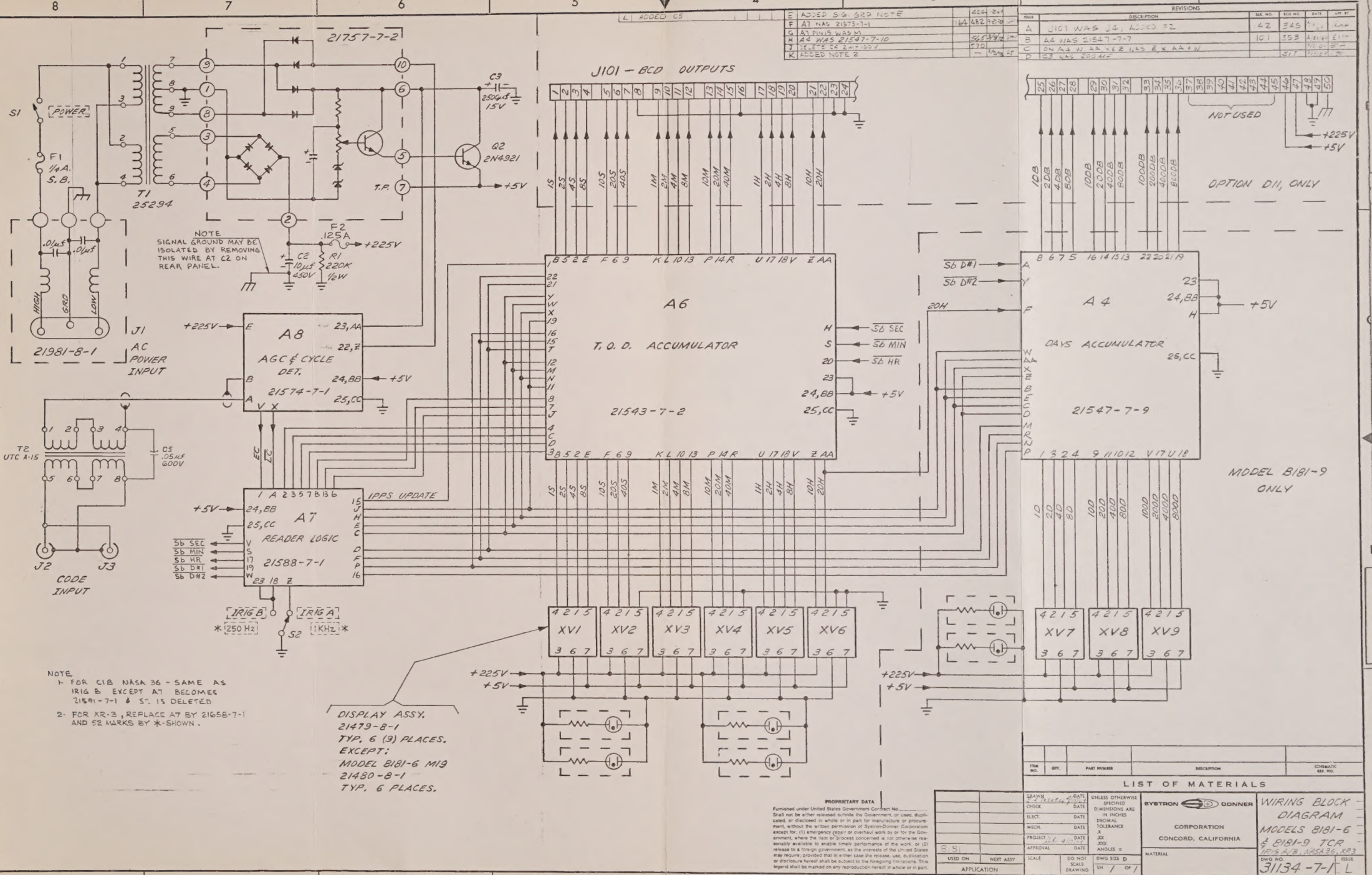
Diodes CR7 and CR8 supply +10 V for the +5 V regulator. The filter is again external. Diodes CR9 and CR10 provide -10 V.

3) REGULATOR

The +5 V regulator is a two stage emitter follower type. R1, R2, CR6 and CR5 form a voltage divider which allows setting the base voltage of Q1 to a desired level. C1 provides filtering for this reference voltage. The emitter of Q1 is connected to the base of an external transistor. The voltage at the emitter of this external transistor may be adjusted to +5 V by R2.

PARTS LIST
POWER SUPPLY BOARD #21757-7-2

REF.	DESCRIPTION	SD PART NO.
	Assembly	C21757-4-1
	Schematic	B21757-7-2
C1	Capacitor, 125 μ F, 10 V or 150 μ F, 15 V	C1147
CR1-4,7-10	Diode, 1N4005	CR0284
CR5	Diode, 1N749A	CR0306
CR6	Diode, 19330	19330
Q1	Transistor, 2N3643	Q0179
R1	Resistor, 330 Ω , 5%, 1/4 W	R0662
R2	Potentiometer, 100 Ω , 5%, 1/4 W	R2495



MP MASTER



MA34109



MP-77363